# RECRUITMENT OF WINTERFAT AS INFLUENCED BY CHEATGRASS: EFFECT OF CHEATGRASS COMPETITION ON WINTERFAST SEEDLING DEVELOPMENT FROM FOUR ECOTYPES

**FINAL PROGRESS REPORT**
**Cooperative agreement RMRS-99599 RJVA**

# Recruitment of Winterfat as Influenced by Cheatgrass: Effect of Cheatgrass Competition on Winterfat Seedling Development from Four Ecotypes

September 27, 2004

Submitted by:
A. L. Hild,
Department of Renewable Resources
University of Wyoming
Laramie, Wyoming

Submitted to:
Dr. Nancy Shaw, Botanist
USDA Forest Service
Forestry Sciences Laboratory
Boise, ID 83702

## Introduction

The purpose of this document is to update our progress on the germination and growth of seeded winterfat (*Ceratoides lanata* [Pursh] J. T. Howell) ecotypes in the presence of cheatgrass (*Bromus tectorum* L.) in the greenhouse portion of our research conducted under joint venture agreement RMRS-99599-RJVA. Field research conducted in Boise is not reported here and will be summarized as Dr. Shaw directs. Here at the University of Wyoming, Dr. Hild and students collected data from greenhouse experiments into spring 2004 as previously reported. Analysis of data was completed in the spring 2004, including the new Open Range winterfat release from the Plant Materials Center in Bridger, Montana. The summarized data from the greenhouse experiments was presented at the Thirteenth Wildland Shrub Symposium in Lubbock Texas in August 2004. Publication of the greenhouse study is in prep and will appear in the proceedings of that symposium.

## Methods

We compared native winterfat (*Ceratoides lanata*) seed collections from the Bird of Prey National Conservation Area to four other seed collections to evaluate the influence of cheatgrass (*Bromus tectorum*) presence on germination and growth of winterfat seedlings. Winterfat seed sources were: 1) native seed collected from the Birds of Prey NCA (BoP), 2) wild seed collection from northern New Mexico near Raton (NM), 3) Northern cold desert selection from the Plant Materials Center in Aberdeen, Idaho (Ab), 4) Open Range release from the Bridger Plant Center in Bridger, Montana (OR). The Ab release is a composite of four eastern and souther Utah and 1 western Colorado accessions selected for cold, drought and alkalinity tolerance. the Ab seed source was derive from a field nursery planting. The BoP seed was a composite of three local

wildland collections. The OR selection is a composite of three accessions from eastern and south-central Montana and south-central Wyoming, selected for seedling vigor and forage and seed production. The OR selection was derived from seed in a nursery planting.

Cheatgrass seed was collected from the BOP and used to provide competition with winterfat seedlings by placing 0, 2, 4 or 8 grass plants per pot. Soils were collected from the BOP area for use in the greenhouse experiments. Winterfat seeds from each source were centered in pots (15 cm dia.) containing cheatgrass seeds at 4 densities: 0, 2, 4, and 8 seedlings per pot around the perimeter. Three pots containing no winterfat were planted at each cheatgrass density to document cheatgrass growth without winterfat present. Plantings were replicated on 5 dates (blocks) in 2003. We documented survival and plant size of winterfat seedlings (canopy volume) and number of grass leaves for 21 weeks (at 4, 5, 7, 9, 11, 13, 15, 17, 19, and 21 weeks). At 21 weeks, plants were harvested to obtain leaf area and total biomass of the cheatgrass and winterfat seedlings.

Data were analyzed using ANOVA appropriate to a factorial arrangement in a RCDB to detect treatment differences. Sampling dates were analyzed as repeated measures. Least significant difference mean separations were evaluated at the 0.05 alpha level in SAS.

**Results**

Two thirds of winterfat mortality occurred in the first 5 weeks after planting. After 21 weeks, survival of winterfat from the seed sources was greatest for the wild collection from northern New Mexico (98.3%) followed by significantly lower survival of the Open Range (79.7%) and Birds of Prey (78.7%) and lowest survival of the Aberdeen seed source (56.7%) when averaged across all cheatgrass competition treatments.

Above-ground growth of cheatgrass (biomass and leaf area) was not different among the 2, 4 and 8 cheatgrass per pot densities, but did differ among the winterfat seed source competitors. Cheatgrass biomass was reduced by 46% when grown with the Northern Cold Desert (AB) seed source. Leaf area of cheatgrass was reduced by 36% when grown with the Northern Cold Desert (Ab) or BoP seed sources relative to New Mexico source winterfat.

Winterfat leaf area and biomass differed among seed sources only without cheatgrass competition in the pots. In weeks 11 through 21, New Mexico winterfat plants were larger and had greater leaf area than winterfat from other seed sources but only without cheatgrass competition. With cheatgrass present, winterfat seedlings from the sources did not differ from one another.

**Discussion**

Results from this greenhouse study will be incorporated with field results from the study site at the BOP which Dr. Shaw has conducted. Greenhouse results suggest that the New Mexico winterfat (a large, woody population) was able to develop larger canopy volume, biomass and leaf area that the more northerly sources in the absence of cheatgrass. Initial establishment of this source was greates over all cheatgrass levels. Ceheatgrass growth was reduces by both the Northern Cold Desert and(Ab) and BoP winterfat seedlings. However, cheatgrrass presence, at any level reduce winterfat canopy volume, biomass, and leaf area more than 90% regardless of seed source.

We presented results of the greenhouse experiments to the shrubland symposium in Lubbock, Texas in August 2004 and will submit a manuscript for publication this fall. Incorporation of field results with the greenhouse studies will be conducted under the

direction and at the discretion and convenience of Dr. Shaw. Funding and research on this project concluded on September 1, 2004.